Chapter 4

PROTECTING THE ENVIRONMENT

Why do we value our natural environment?

What is Green Infrastructure?

How will Lexington protect its natural resources in an urban environment?

An Environmental Impact

A community that values is natural environment and iconic landscapes is one that commits to grassroots stewardship and public policies that conserve natural resources and preserve and improve the natural surroundings. More succinctly, in a variation on the ethic of reciprocity, Kentucky's Wendell Berry advises us to

"Do unto those downstream

as you would have those upstream do to you."

Lexington depends on its natural environment. Our urban area is surrounded by thousands of acres of farms and natural lands, a result in part of steadfast policies that measure when - or if - our rural area will be developed for something else. We have lived the consequences of building in floodplains and seeing the damage downstream. We deferred maintenance of sewage lines that resulted in waterway pollution.

Lexington is increasingly becoming more environmentally conscious. We are starting to build green infrastructure principles into our infrastructure planning. We create tree protection areas, construct rain gardens, ride on shared use trails, and naturalize riparian areas. We know that clean fuels and reduced fuel usage result in cleaner air.

Green infrastructure is an interconnected network of landscapes and natural resources that contributes to environmental health and the health and quality of life for the citizens of Lexington. The 1994 Greenspace Plan says greenspace includes the resources, linkages, and sites that contribute to the Bluegrass identity. Green Infrastructure, therefore, includes both cultural and natural features, with our scenic rural landscape types, including the Palisades and other rural natural areas, urban parks, downtown, and historic neighborhoods. our natural resources are composed of the plants, animals, soil, and water that make our landscapes unique.

Sound Planning and management of green infrastructure benefit the overall economy, environment, and community. The sustainability of our landscapes and natural resources, therefore is inextricably linked to our community values and needs.

How does protecting the environment benefit Lexington?

- Enables clean air and water
- Reduces the cost and impact of flooding
- Improves individual health and quality of life
- Ensures a clean and reliable source of water
- Regulates climate

What does the 2013 Comprehensive Plan recommend?

- Follow the recommendations of Empower Lexington.
- Increase transit options and street connectivity.
- Incorporate green infrastructure principles into gray infrastructure projects.
- Improve water quality by implementing the Capacity Assurance Program.

Air Quality
Clean air is necessary for good health, especially for children, the elderly and people with chronic breathing issues. Air pollution is a collective term for many types of airborne contaminants, but the major focus of most pollution reduction efforts focuses on ground level ozone, particulate matter (both coarse and fine), oxides of nitrogen, and other greenhouse gases such as carbon dioxide and methane. These pollutants have been shown to adversely affect human health and welfare and are produced by fuel burned to generate electricity, vehicular emissions, nitrogen-based synthetic fertilizers, landfills and fermenting livestock waste.

Exhaust from motor vehicles creates about one-third of our air pollutants. Fayette County has been in attainment for Federal air quality standards since 2006 for the six criteria pollutants established through the Clean Air Act. Although Lexington is currently meeting Federal standards, data show that Lexington is close to exceeding the thresholds of two of the standards. The pollutants of most concern are ground level ozone and particulate matter. The Lexington Area Metropolitan Planning Organization (MPO) monitors these pollutants in the summer months to alert citizens of potential unhealthy levels. Ground level ozone formation occurs when hot, sunny weather and stagnant air patterns mix with various pollutants.

In 2011, the three-year average reading for ozone in Fayette County was 0.069 parts per million (ppm), which is comfortably below the standard of 0.075 ppm. The very hot summer of 2012, however, produced high ozone readings, with several readings above 0.080 ppm, which resulted in the MPO issuing three ozone alerts. It is possible that the Fayette County air quality monitor readings will exceed the ozone standard if summer weather patters continue as in 2012. Similarly, particulate matter pollution readings, although not as dependent on weather factors, have been near the Federal standard of 12 micrograms per cubic meter (ug/m3). In 2011, the three year average for the Fayette County monitor was 11.2 ug/m3.

All the Division of Waste Management refuse fleet now uses biodiesel fuel. In 2012, the Division purchased two electric trucks to collect recyclables and waste from downtown containers. By late spring 2014, LFUCG will have five to six refuse trucks that are fueled with compressed natural gas power. Compressed natural gas is the cleanest burning fossil fuel. CNG emits 6 to 11 percent lower levels of greenhouse gases than gasoline. It can reduce vehicle maintenance cost by 40 percent. As a fuel, CNG is 15-50 percent less than gasoline. There are little to no emissions during refueling.

Good transportations and land use planning contribute to the environmental health of Lexington. Bicycling, walking and public transit are energy-efficient means of travel that reduce emissions. A network of connected streets reduces total travel distances and time spent traveling or sitting in traffic, which results in reduced emissions. Transit-oriented retrofits for existing developments enable bus access and ridership throughout Lexington.

Energy Usage and *Empower Lexington*
After months of community input and consideration, the Urban County Council adopted Empower Lexington in 2012. The goal of Empower Lexington is for Lexington to become a more sustainable

and resilient community by reducing energy use by one percent a year. The Plan recommends numerous best management practices to reduce energy consumption and emissions for the transportation, industrial, agricultural and waste sectors, as well as residential and commercial uses.

The Empower Lexington Plan is voluntary so community participation will depend upon citizens, businesses, industries and institutions embracing the recommendations in order to reach the goal. Increasingly, citizens-based stewardship provides a role in improving, conserving and maintaining environmental health.

Transportation. Transportation practices include increasing transit service (local and regional) and developing a comprehensive bicycle and pedestrian infrastructure network. Additional recommendations include increasing ridesharing and vanpooling, pursuing highway projects that reduce congestion such as roundabouts and signal timing improvements, encouraging the use of alternative fuels that pollute less and using more energy efficient vehicles.

Buildings. Best Practices for buildings include sustainable and green building designs, such as building orientation and green roofs, natural lighting and high efficiency heating and cooling systems. Individuals can adopt a variety of low-cost practices to reduce energy that include installation of new appliances, programmable thermostats and better insulation.

Land, Food, and Agriculture. Trees and vegetative cover facilitate carbon sequestration, a natural process of capturing and storing carbon dioxide from the atmosphere. Forested land sequesters 1.3 tons of carbon dioxide per acre and agriculture cropland sequesters 0.05 tons per acre.

Waste. The Empower Lexington Plan and the 5-year Update of the Area Solid Waste Management Plan recommend Lexington pursue a goal of zero waste. This recommendation is based on the premise that waste should be viewed as a resource to be managed, that was transportation uses energy and creates emissions and landfills generate methane, which is a potent greenhouse gas. Waste reduction practices include developing a comprehensive program to promote the benefits of organic waste, more reuse, and composting.

Green Infrastructure Network

A green infrastructure network is composed of hubs and corridors. Hubs are areas that provide sufficient space for green infrastructure to flourish and function properly. They include sites such as natural areas, working lands, parks, and urban greenspace. Corridors serve as biological, migratory and recreational channels that connect hubs. They include greenways and some transportation and utility corridors. An interconnected network of hubs and corridors increases the number of services and benefits they provide.

The hubs and corridors concept was introduced in the 1994 Greenspace Plan which recommended a greenspace system that includes resources, sites and linkages for both urban and rural greenspace. A green infrastructure network takes the concepts from the greenspace plan and other plans to the next level by elevating hubs

and corridors to *infrastructure* status, and integrating them into strategic planning, management and funding decisions.

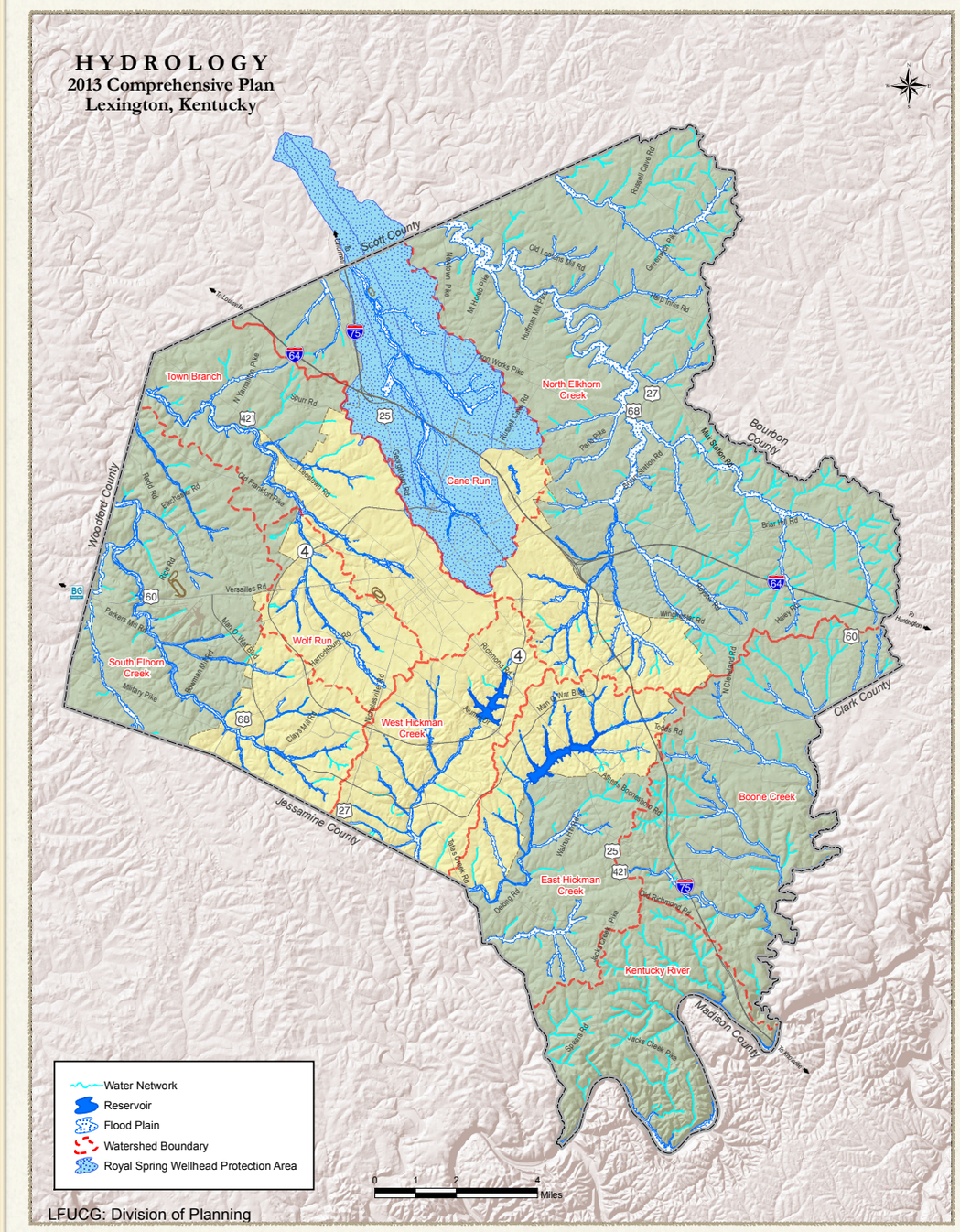
LFUCG conducted a preliminary inventory of green infrastructure components. The next step is to complete and update the inventory and analyze it for gaps in the network, and for opportunities and barriers. Environmentally sensitive areas and geologic hazard areas are subsets of the natural resources mentioned in the Subdivision Regulations for attention, but are not limited to steep slopes, sinkholes, poor soils, wetlands, aquifer recharge areas, floodplains, improper fills, and significant trees and tree stands. Geologic hazard areas include areas of excessive flooding, clusters of sinkholes, cliffs and caves near the surface.

Soils

Unlike most large cities, Lexington is not located on a major body of water, nor are there expansive forests or mountaintops to protect. Our most significant natural asset is the rich, fertile soil that sustains a thriving agricultural industry. Originating from the underlying Lexington limestone, the fertile soils and mineral-rich water have been integral to the diversity in crop, equine, and livestock farming since the area was settled.

As rising population increasingly places demands on U.S. farms for food, the preservation and conservation of the best soils is imperative for food security. Fayette County is positioned well for the future demand. In the rural area, 88 percent of the land is prime soils (58 percent) or soils of statewide significance (30 percent). Of the 29,275 acres in conservation easements (26,457 in PDR), 89 percent are

Map 4.1 Hydrology



considered prime of soils of statewide significance.

Erosion control is an essential component of protecting soil resources. All levels of government regulate erosion, particularly for water quality. The Fayette County Conservation District assists farmers in efficient methods of soil erosion prevention. At the Federal level, farms participating in USDA programs must comply with The Highly Erodible Land and Wetland Conservation rules.

Water Resources

The Inner Bluegrass is characterized by springs, caves, and sinkholes prevalent in karst geology. In Fayette County, there are 11,256 acres of FEMA regulated floodplain, of which 6,230 acres are within the Urban Service Area. There are nine watersheds in Fayette County, with Kentucky River and Boone Creek watershed located exclusively within the rural area. Headwaters for the streams within the other seven watersheds originate inside the Urban Service Area.

Like other cities of similar size, major pollutants of concern in Lexington are nutrients, pathogens and sediment. In addition, some stream segments lack suitable habitat and insects support a fish population. Streams have been assessed by the Kentucky Division of Water to determine if they support designated uses for recreational contact, fish consumption, drinking water, and aquatic habitat. All nine watersheds have streams not meeting full support for at least one use. Town Branch improved from non-support in 2008 to partial support for warm water aquatic habitat in 2010.

Consent Decree and CAP

In 2011, LFUCG entered into a Consent Decree with the U.S. EPA and the Commonwealth of Kentucky to resolve violations of the Clean Water Act associated with LFUCG's sanitary sewer and storm sewer systems. The Consent Decree requires LFUCG to implement infrastructure projects and maintenance programs to reduce the number of sanitary sewer overflows. The LFUCH Division of Water Quality has identified $590 million in improvement projects to be constructed over the next 11-13 years, including replacing sewer lines, constructing wet weather storage facilities, constructing new pump stations and upgrading the two treatment plants.

A significant component of the Consent Decree is the Capacity Assurance Program. The CAP was developed over several months by community leaders and elected officials as a way of managing access to the sanitary sewer system. Through a combination of capacity credits and system improvements, greenfield and infill development will be able to continue, but at a monitored and measured pace.

The Consent Decree and LFUCG's Municipal Separate Storm Sewer System (MS4) permit with the Commonwealth require LFUCG to implement a comprehensive Stormwater Quality Management Program (SWQMP) to reduce the discharge of pollutants form the MS4 into Fayette County streams. LFUCG began implementing the SWQMP in 2008, which involves developing programs and operational procedures to address the following areas:

- Watershed Management
- Pubic education and involvement
- Illicit discharges

- Construction sites
- New development and redevelopment
- Municipal operations
- Industrial facilities
- Water quality monitoring

Impervious surfaces, such a roofs, parking lots, and driveways, do no absorb water when it rains. During rains, impervious surfaces, exacerbate stormwater runoff that moves quickly, which leads to flooding, water pollution, and erosion problems.

In the Urban Service Area, 37 percent of the land area is impervious surface. Receiving streams are considered *degraded* in urban watersheds with more than 30 percent impervious surface and *impacted* for 10 to 30 percent impervious. The Wolf Run watershed is contained entirely within the Urban Service Area and has 39 percent impervious cover. The West Hickman watershed is 93 percent within the USA and has 40 percent impervious cover.

Water Protection

New ordinances were adopted in 2009 and 2010 to improve water quality by addressing maintenance of privately-owned stormwater controls, erosion and sediment control, illicit discharges and illegal connections, enforcement, and industrial and high risk commercial stormwater runoff.

The LFUCG Storm Water Management Low Impact Development Guidelines for New Development and Redevelopment was developed in 2012 as a supplement to the Stormwater Manual to promote the use of best management practices, such as pervious surfaces, bioswales, and rainwater harvesting to minimize impervious area and runoff.

Additional regulations related to water quality are in the Stormwater Manual and Article 19 of the Zoning Ordinance. Guidelines are available for retaining spills at gas stations and other protective measures, depending upon the type of business.

Fayette County's drinking water source is the Kentucky River, with intake pools and treatment plants in Fayette County and Owen Counties. The 20-Year Comprehensive Water Supply Plan recommends that the Kentucky River and its tributaries should be protected from dumping, discharges, spills and undesirable development for a minimum of one mile upstream of the intake pools.

The Royal Spring Aquifer is the source of Georgetown's drinking water. Eighty percent of the aquifer recharge area is in Fayette County, which includes 1,624 acres of the Cane Run Watershed and extends to Seventh Street near downtown. The Royal Spring Aquifer Wellhead Protection Plan calls for appropriate containment of runoff from development in the recharge area.

Wetlands area regulated under the U.S. Army Corps of Engineers General Permits. An area as small as a half acre may be subject to individual permitting requirements before it can be dredged, filled, or modified. A precise delineation in the field is warranted for permit applications.

PROTECTING THE ENVIRONMENT

Environmentally sensitive and geologic hazard areas are governed by the Subdivision Regulations and Division of Engineering Technical Manuals. Developers note this information on the Environmental Routing Form for development plan applications.

To protect streams on farms larger than 10 acres, the Kentucky Division of Water requires an Agriculture Water Quality Plan. It uses National Resource Conservation Service standards for nutrient loads and recommends best management practices.

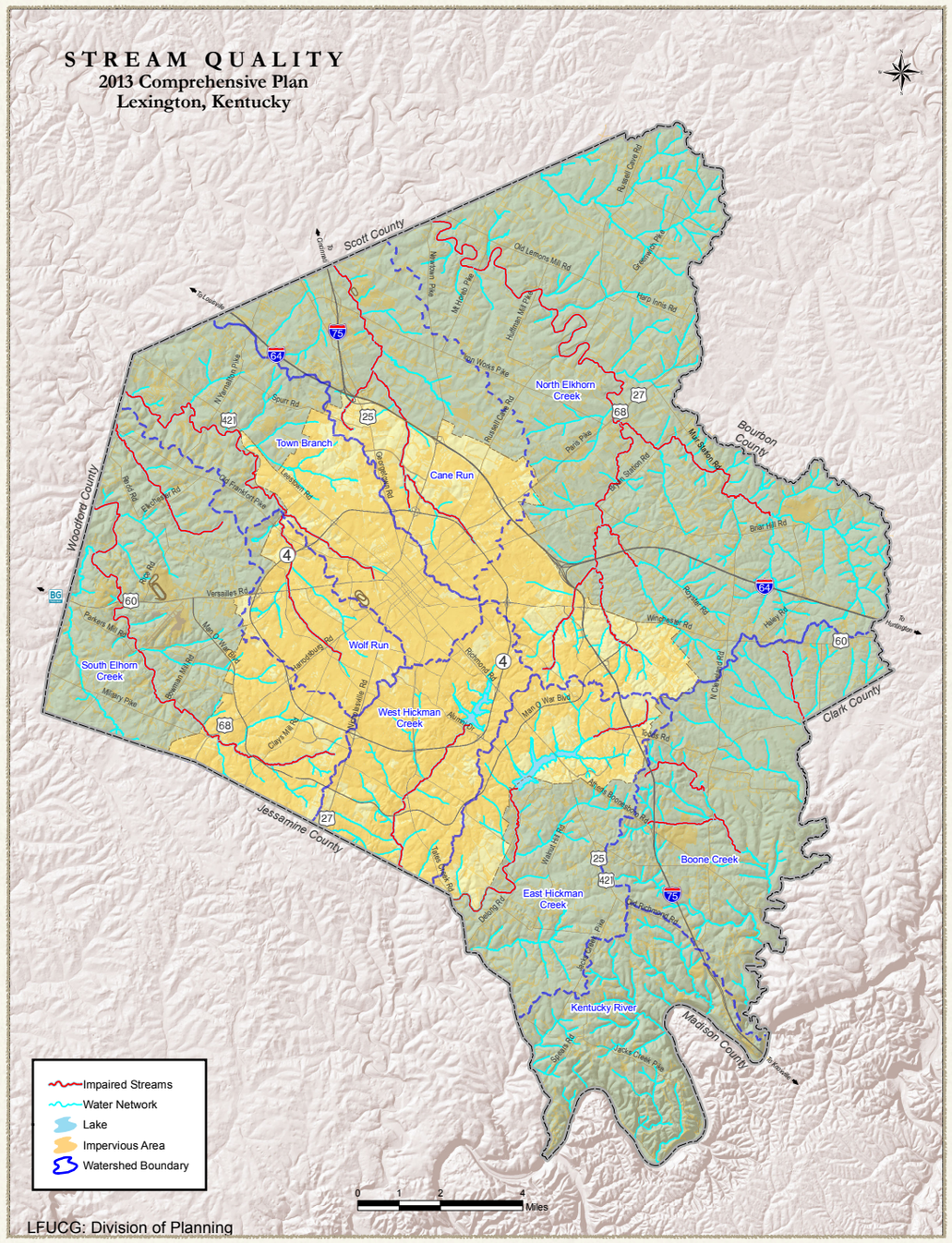
The Stormwater Manual sets a no-mow zone for a minimum 25 feet from all stream bank to protect water quality from erosion and improved infiltration. Other measures to protect water quality include street sweeping in the urban area, measured and reduced use of road salt, a no-mow policy along stream banks, litter control, reforestation of riparian buffers, and public education.

Pollutants from street runoff impair water quality. The recommendations of the draft Complete Streets Manual would help reduce stormwater runoff through reduced pavement. It also advocated for low impact development practices for stormwater runoff where appropriate.

Conservation Greenways

The Greenway Master Plan designates streams, floodplains, riparian vegetation, and associated environmentally sensitive or geologic hazard areas as conservation greenways to improve water quality, provide wildlife habitat, and control flooding. There are about 110 miles of stream and tributaries in the Urban Service Area. State and

Map 4.2 Lorem Ipsum dolor amet, consectetur



local governments manage 26 percent of the total urban stream mileage and another 14 percent is scheduled to be acquired by LFUCG in the future with new development. The remaining 60 percent are in private ownership.

There are 869 acres of floodplain owned by LFUCG, of which 719 acres are in the Urban Service Area. Property management is primarily divided between:

- Division of Engineering - 36 acres
- Division of Water Quality - 167 acres
- Division of Parks and Recreation - 404 acres (150+ rural acres)

The remaining 112 acres of LFUCG floodplain are on other LFUCG properties or in easements. An additional 164 acres of floodplain have been recorded on plats for LFUCG to acquire while another 370 acres of floodplain and proposed trail routes within the Urban Service Area have been identified as public greenways.

All greenways provide open space. Seventy percent of LFUCG greenways provide multiple benefits from a combination of natural resource protection, transportation, or recreational service and stormwater management. Currently, 814 of the 869 acres under LFUCG ownership are intended to be managed for conservation. 590 acres include an existing or proposed trail and 111 acres have a stormwater component (basin).

Combining existing with recorded plats and future greenways, there is potential for 1,400 acres of LFUCG greenways, of which 1,000 ares could function as both conservation and trail greenways.

Other owners of conservation greenways in the Urban Service Area include:

- Homeowners' association - 186 acres
- Public or private schools - 13 acres
- State government - 7 acres (+403 rural acres)
- Future development not designated for LFUCG ownership - 246 acres
- Floodplains on private property - 934 acres

LFUCG is attempting to re-establish vegetation in its own riparian zones by removing invasive species and replanting with natives, Reforest the Bluegrass events, and natural succession. Since 2003, LFUCG has selected one greenway each year for a restoration project, totaling 58.5 acres at a restoration and maintenance cost of over $1.3 million.

In the future, partnership with outside groups must be part of the solution. For example, in 2012, the Friends of Wolf Run matched a $78,000 award for projects and maintenance in the Wolf Run watershed with volunteer time. Since 2009, neighborhood groups, schools, and nonprofit and religious organizations have been awarded nearly $1 million for environmental grants in greenways through various programs.

Better coordination between Divisions and uniform and efficient management of greenways would be addressed with the creation of a Greenway Program and the adoption of the draft Greenway Manual. The Greenway Program's staff would be responsible for implementing

the 2002 Greenway Master Plan and would be the point of contact for greenway matters. The program would include the critical components that are currently lacking for public education and information, outreach and volunteer coordination.

The Expansion Area Master Plan proposed that stormwater management facilities be located in floodplains that are dedicated as greenways to LFUCG or placed in conservation easements. Besides conservation and stormwater management, the greenways in the expansion area provide public open space and a unifying link for residents to parks and commercial areas.

The 2002 Greenway Master Plan further expanded floodplain protection by designating all urban 100-year floodplains and rural stream buffers in Fayette County as conservation greenways. Since then, greenways in large new developments in the non-Expansion Urban Service Area have been owned and managed by wither LFUCG or homeowners' associations.

The draft Greenway Manual calls for a Management Plan to be developed for each LFUCG greenway. The Management Plan will establish goals and strategies for each greenway.

Plants and Animals of the Region and their Habitats

Located along the Kentucky River, the 732-acre Raven Run and 287-acre Floracliff Nature Sanctuaries preserve native vegetation, including rare plant species. This upland wooded area is also where more conservation efforts by private property owners have occurred. In the last 10 years, the Kentucky Division of Forestry helped Fayette County landowners prepare 64 Stewardship Plans covering 4,545 acres, including planting 114 acres in trees and 207 acres in timber stand improvements, mostly through invasive species eradication.

In the Rural area, trees are predominantly along fence-rows, property boundaries, creeks, and roads. The urban forest is primarily found along streams, in street rights of way, and in natural areas. Potential locations for wildlife habitat and natural areas, springs, caves, and urban stream corridors. Satellite data shows no significant forest cover except what it adjacent to the Kentucky River Palisades. Extensively wooded, the Kentucky River corridor and tributaries support a diversity of plants and wildlife. Inside the Urban Service Area, restoration efforts at the 26-acre McConnell Springs Nature Park protect plants, urban wildlife, and the unique geological, historic, and cultural resources on the site. Other urban areas with significant plant life or habitat include:

- The Arboretum on the campus of the University of Kentucky is the State Botanical Garden and features a diverse and unique collection of native plants and wildlife habitats throughout its 100 acres of gardens, woods, and wetland.
- Lexington Cemetery has mature trees and expansive gardens that provide habitat and attract bird populations at its 170-acre site.
- Public golf courses at Tates Creek, Kearney Hills, and Lakeside are Certified Audubon Bird Sanctuaries. Meadowbrook Golf Course is seeking certification.
- Reservoirs support waterfowl during winter.
- Naturalized areas have been restored with native species or left natural and un-mowed to enable natural succession.

PROTECTING THE ENVIRONMENT

Pockets of natural areas have limited ecological value due to their isolation, small size, or configuration. Corridors connecting natural areas could increase plant productivity, biodiversity, and range for larger animals to travel. Corridors can include streams, utility lines, and rail lines. With 60 percent of Lexington's urban stream miles extending through residential property, managing stream banks for teh benefit of native plants and animals is challenging.

Remainders of small, isolated woodlands may merit protection or rehabilitation, if established criteria are met. Criteria may include size, location, and condition of the stand. While value for habitat is limited, small stands may provide other environmental as well as social and economic benefits, such as an increase in overall canopy coverage. Tree stands increase in ecological value if they are linked to other natural areas by a natural corridor.

Street trees are required for new developments and in redevelopment of residential and commercial properties to meet tree canopy coverage goals, according to Article 26 of the Zoning Ordinance. The Ordinance describes protection measures to be used during development for significant trees, riparian zones, greenways, environmentally sensitive areas, historic turnpike trees, perimeter trees and tree stands.

Invasive plant species are a serious issue throughout Fayette County, especially when they invade areas that are already restored. The Emerald Ash Borer beetle, which entered Fayette County in 2010, poses a serious threat to the urban forest. It is expected that within five years, untreated ash trees will not have survived the infestation. LFUCG has directed its resources to protecting the significant Blue Ash trees in public parks.

Raven Run, Floracliff, and McConnell Springs each has a management plan to combat invasive plants, such as Japanese bush honeysuckle. Management plans for natural resources and wildlife for other LFUCG properties should be developed. An effective management plan would inform budgetary decisions for funding the management of public properties in the context of a green infrastructure network and services.

In Fayette County, the U.S. Fish and Wildlife Service list one mammal, the Indiana Bat, and one plant, Running Buffalo Clover, as endangered and protected by law.

Topography Protection

According to the Subdivision Regulations, land over 15 percent gradient is considered steep and requires and assessment for possible geotechnical modifications prior to construction. The Regulations may need to be reviewed to ensure that they adequately protect steep slopes and potential erosion sites, especially where small lots are proposed or the lots area adjacent to environmentally sensitive or geologic hazard areas. The Subdivision Regulations state that developments should preserve landforms and follow contours.

Recommendations for new policies

- Incorporate green infrastructure principles into gray infrastructure projects as roads, utilities, and buildings are constructed, replaced, or repaired.
- Update the green infrastructure inventory and analyze it for gaps in the network; identify opportunities to improve network coverage and linkage.
- Restore greenways and improve water quality of streams by naturalizing stream corridors.
- Pursue partnerships with schools, service agencies, business, and citizen groups for greenway maintenance and projects
- Establish a Greenway Program and adopt the Greenway Manual (draft) in order to provide consistent and efficient management of LFUCG greenways and to implement the Greenway Master Plan.
- Review and update the Subdivision Regulations to ensure there is adequate protection for steep slopes and building sites subject to erosion and to identify barriers to preserving landforms.
- Establish criteria for evaluating small woodlands for protection or rehabilitation.